Summer 6-1896

Volume 5 - Issue 9 - June, 1896

Rose Technic Staff
Rose-Hulman Institute of Technology

THE ROSE TECHNIC.

VOL. V. Terre Haute, Ind., June, 1896. No. 9

THE TECHNIC.

TERMS.

One year, $1.00. Single Copies, 15 Cents.

Issued Monthly at Rose Polytechnic Institute.

Entered at the Post Office, Terre Haute, Ind., as second-class mail matter.

NOTICE TO SUBSCRIBERS.

Hereafter we shall follow the general rule regarding subscriptions, and shall continue sending THE TECHNIC to subscribers until notified to discontinue.

AGAIN the close of the school year is at hand and with the general winding up of affairs collegiate, the management of THE TECHNIC prepares to lay down its implements of strife and indulge in a good long breath. Forgotten for a time will be the terrible appetite of the printing press for its monthly meal of copy. The editors will hear only in lingering dreams of the past the ever repeated yet unanswerable question, "When will THE TECHNIC be out?" The business manager, he of the cold hard mien and the absolute veto expressed in his "can't afford it," will lose for a few short months his absorbing interest in the battle of the bills—payable and receivable.

With this cessation of hostilities the natural impulse is to turn and look back over the field. The retrospect is not all pleasing and even less so than when in the heat of the conflict. In the present clearer view it is easy to see points of vantage which we failed to take, of advances which should have been retreats, and retreats when the voice of opportunity called to go forward. But our feelings are not entirely of regret. To our subscribers and contributors we must express the most sincere thanks. To the former for having borne with our shortcomings and cheered us on our way with words of appreciation. And to the latter for the ready and cheerful response with which the invitation to occupy a place in the columns of the paper has been invariably received. Without such evidences of hearty interest and willingness to lend a hand the lot of the editor would indeed be a hard one.

In a school of the character of the Institute the student paper bears a very different character from that of the one in a classical or literary institution. There it is often for the most part simply the organ of the literary societies, providing a means for the publication of their productions and of practice in lines of work which a majority or the students are pursuing directly. With the technical school the college journal partakes more of the nature of a newspaper, recording and commenting on happenings and things in and about the school. Whatever in the way of special contributions it may contain are almost always prepared for it especially and in the midst of duties of a very different nature. Thus it is that these articles mean more both for the paper and the contributor.

In the midst of the gratitude which we have expressed for the favors that have been shown to THE TECHNIC in the past, we would not forget those who will come after us. We trust that the management of the paper during the coming year may meet with the same full measure of encouragement and more.

Several changes in the personnel of the board will take place after the present number. Two members have graduated with the class of '96 and three others have resigned. Not all of these va-

cancies have been filled, the intention being to fill them at an election to be held during the next fall term. The board as it stands will be as follows:

J. H. Hall . . . . . Editor-in-Chief
J. J. McLellan . . . . . Assistant Editor
J. J. Kessler . . . . . Alumni
J. H. Hellweg, Jr . . . . . Athletics
J. J. McLellan, A. C. Eastwood } . . . . . Local
W. D. Crebs . . . . . Exchange
J. T. Montgomery . . . . . Business Manager
———— . . . . . Assistant

With the increasing size of the paper the duties of the editor-in-chief have become quite heavy, inasmuch as they must be performed in addition to the work of his course in the Institute. Recognizing this, the board has created an additional position on the staff, that of assistant editor. To the student body we need say nothing in regard to the ability and push which characterizes the work of both Mr. Hall and Mr. McLellan. In their hands the prosperity of THE TECHNIC is assured. Again we wish them the fullest support and sympathy of the Institute, and the greatest success in every way.

* * *

A PROBLEM which has engaged no little amount of attention from the faculty for some years past is that of harmonizing the thesis work in the senior year with the regular work of the course. Heretofore the six weeks of special thesis time has been distributed to some extent through the last two terms of the year. Under this plan the student began work on his thesis subject early in the winter term. It was found that in many cases his interest in the regular work began to decline from this point on. More especially was this so in the last term after the greater part of the experimental work on the thesis had been done, and that of calculation and collaboration of results remained. It is not by any means desired that any interest should be taken from the preparation of theses. But with the belief that it need not necessarily detract from that devoted to the regular work if properly arranged, a change will probably be made next year. This will consist in the placing of the whole six weeks of the time for thesis work exclusively, at the end of the spring term. The thesis subjects, however, will be selected in the preceding fall term in order to give opportunity for preparation, such as reading up on the subject selected.

* * *

THOSE who were so fortunate as to be present at the State Field Day held at Lafayette, May 29, witnessed an unusually interesting athletic performance. The close rivalry between Purdue and Rose, and the uncertainty up to the the very last as to which would prove the victor, kept the friends of both at the closest of attention and lent added interest to the contest. The narrowness of the margin on which the victory hung is evident from the consideration that first place in any one event transferred from Purdue to Rose would have turned the tables. The athletes of both institutions are to be congratulated on the sturdy, determined effort which they put forth. To the winners be all the greater honor. While it is impossible to repress a certain feeling of regret that the long chain of victories for Rose is broken, yet it is certain that the general cause of athletics in the state will profit by it. It is impossible to feed enthusiasm continually on either hope or success alone. The former discourages, the latter enervates. To our own athletes there comes the slight consolation that had the list of events remained as it was in years before the pennant would almost certainly have been ours.

A high degree of credit must be accounted the managers of the event for their excellent preparations and thorough execution of even the smaller details of such a difficult affair. Very few complaints were to be heard from visiting contestants, and these were heard with the greatest of courtesy and given prompt attention. Purdue certainly fulfilled her promise of a royal reception to her visitors. From every standpoint the meet was a most enjoyable one.

A SUGGESTION has been made with regard to the local department of THE TECHNIC which would, no doubt, prove of much value. It is that a column be set apart for short original sketches mostly on subjects of a local nature, by students. Professor Wickersham has agreed to cooperate with the local editors and will conduct competitions among the members of his classes with the understanding that the most acceptable productions will be published in these columns. The need of more thorough training in the art of composition and expression in the work of the Institute has often been pointed out. Such was indeed the motive at the bottom of this suggestion. If THE TECHNIC can contribute in some measure towards supplying this marked deficiency and at the same time reap the benefit of increased interest in one of its departments, the result will be most happy. The plan is recommended to the management of the paper for next year and to the students in general, who must support it if it be successful.

* * *

THE TECHNIC joins with the many warm friends of Colonel Richard W. Thompson, president of the board of managers of the institute in extending congratulations to him on the safe passage of his eighty-seventh mile stone on his eventful life-journey. He celebrated the anniversary, which occurred on the ninth instant, by receiving in an informal way the many friends who called at his residence. Since then he has attended the national convention at St. Louis. He still defends with ability the the title of "the old man eloquent."

ABSTRACTS OF THESES

AS READ AT COMMENCEMENT.

COMPARISON OF RHEOSTAT AND SERIES PARALLEL CONTROLLERS IN ELECTRIC STREET CAR SERVICE.

WALTER L. DECKER

The subject of the work which Messrs. Smith, Hunt, Liggett and myself chose for our thesis is "A Comparison of the Rheostat and Series Parallel Controllers." The controller is the apparatus used in starting and stopping an electric car, and nearly all of you are familiar with its position on the front part of the car, if not with the detail of manipulation. The current that a motor will take under any conditions is that which is due to the difference between the direct electromotive force of the current and the counter electromotive force of the motor itself. A motor starting from rest has at first no counter electromotive force and the only obstacle to the flow of current through the armature would be the resistance within the machine itself, which being very small would permit an enormous current to flow through its coils, and this would inevitably result in a burn out if it were not checked. This is the reason why the rheostat is almost universally used, as it first opposes a great artificial resistance, and this is decreased as speed is gained and counter electromotive force generated.

The essential difference in these controllers is, that in the rheostat controller the current is first sent through an external resistance to bring it down to the proper strength to enter the motor, while in the series parallel controller the resistance is mainly interior, and is made up by throwing the field coils and the armature coils of the sep-

arate motors into various combinations with each other. The work which is spent in sending the current through the external resistance is entirely lost and dissipates itself in heating the coils.

The rheostat controller consists of an iron rod which passes from the dash board underneath the car floor, and by means of a lever causes the contact piece to slide over the contact board, thus changing the number of coils through which the current passes before entering the motor fields. The reversing switch, which regulates the direction of the current in the armature and consequently the direction of motion of the car, is situated just at the side of the controlling lever and passes underneath the platform to the reversing switch board. These contact and switch boards soon get out of order and this is one advantage gained in using the series parallel controller.

The series parallel controller consists of an upright rod having contact pieces fixed along its length in such a manner that by turning the handle of the controller, the current is sent through different resistances for each point of contact. The first notch throws the whole resistance and the two motors in series. The second notch cuts out half the resistance, and the third notch the whole external resistance. The fourth notch throws both motors in parallel with one another and each in series with half the resistance. The fifth notch cuts out the resistance of one motor and the sixth notch cuts out the resistance of the other motor, leaving them in parallel, which gives the greatest speed and highest efficiency. The reversing switch is placed on top of the controller lid, and has one marked advantage over the other reversing switch, in that the current can only be shut off from the motors, when the controlling switch is at zero position. This prevents any large current from being sent suddenly through the motors, as the resistance must be cut down step by step by the controlling lever and not suddenly.

Due to the kindness of the Louisville Railway Company, we were able to make a test of these controllers on their lines during the latter part of March. The instruments used in this test were a Thomson integrating watt-meter, a recording watt-meter made here at the Institute, and a Weston volt-meter, and ammeter. The recording watt-meter was used for tracing curves of the starts made by the two methods of control, and its action is as follows:

The speaker here placed the instrument on the table and explained its operation.

The Thomson integrating watt-meter was used for finding the number of watts used in making the entire trip, forty stops being made each trip. Several trips with only the integrating watt-meter in circuit were made for each controller and the result showed a saving of 14 % in the case of the unloaded car, and a saving of 12 % in the case of the loaded car in favor of the series parallel controller. As the number of stops, load and track were the same for each controller, this saving was made in the start, for when the car is once under headway the watts used are in either case the same. Thus it would go to prove that in the city where the stops are varied and frequent, the series parallel controller is the more economical of the two.

DERIVATIVES OF THE NEIGHBORING XYLILLIC ACID.

WILLIAM E. BURK.

Among the most important things known to the science of chemistry, for the world practically, and to the investigator, are the means of obtaining a product by synthetic methods, for with the composition of a substance known, its preparation can in general be effected by such methods.

In the field of organic chemistry it has been the means, perhaps as much as any other class of work, of bringing the science up to its present stage of development, which present condition in comparison with that of only a few years ago is is almost beyond reckoning.

Such work has thrown floods of light on the structure and internal arrangement of molecules,

has grouped together great classes of compounds having in common certain nuclei, and has made clear many tangles and set much aright.

Not alone for theoretical purposes has this work served, but in practical affairs; products are now manufactured in quantities that were formerly rare, and in many cases artificially prepared products have replaced the same products from nature and at a cost of a mere trifle in comparison.

Wöhler, a German chemist, in 1828 prepared the first organic compound by synthetic means, it being thought up to that time that from nature all so-called "organic" compounds came and to nature must be looked for the supply. Wöhler's work consisted of the preparation of urea by the heating of ammonium cyanate.

This work was followed in the fifties by Kolbe and Frankland, the former preparing acetic acid synthetically, and the latter doing his important work of the building up of hydro-carbons from substances of simpler composition.

The importance of synthetic research was from thenceforth recognized in an increasing degree, and it was with artificial modes of preparation that the constitution of many substances could first be deduced with certainty. Thus, the rational composition of acetic acid was arrived at from its formation from methyl cyanide and sodium methyl.

One of the most brilliant works, and one showing clearly the great possibilities of synthesis is that of Emil Fisher on the carbo-hydrates, in which he prepared ordinary cane sugar synthetically, using glycerine as a basis, and in which he showed that the formation of sugars in general was of the nature of the condensation of formaldehyde.

Of a practical nature much has been done synthetically on the coal-tar products, producing medicines, coloring matters, flavoring extracts, and perfumes.

Probably the synthesis of greatest economic importance was that of alizarin by Graebe and Lieberman. Alizarin is the compound used in dying for the color known as "Turkey red," and was formerly obtained by extraction from the madder root which was produced on a large scale in this way in France and some of the south countries; but this large industry has been entirely destroyed and replaced by the artificial preparation of alizarin from anthracene, a coal-tar product. It is said by authority that the savings to manufacturers by the use of artificially prepared alizarin alone has been enough to equip and maintain all the chemical laboratories in the world.

In medicines the very large class of anti-fevers similar in nature to anti-pyrine, have for their preparation coal-tar as a basis and synthetic chemistry methods as means.

Among perfumes, on which there has been elaborate work done, are to be mentioned musk and the violet.

The odor of musk is shown to be characteristic of a class of substituted hydro-carbons of the aromatic series containing the propyl, butyl, or amyl group, and is prepared from the phenol-ethers.

The odor of violet is due, according to Tiemann, to a substance contained in the violet root known as iron, and an artificial compound known as ionen was prepared by him from the phenyl-hydrozones, the difference in odor of which from the natural violet could not be detected except with rare expertness.

As a means of determining structure, synthesis is of very great importance. The structural formula of camphor is unknown, and as yet no satisfactory and conclusive evidence has been produced concerningany of the proposed formulæ. Among the most acceptable is that of Collie, which is a kekulè benzene ring formation containing two methyl groups in the meta positions and a methylene and carbonyl group in the position connected by double union.

With the idea of comparison of a derivative of camphor, campholytic acid, with some compound having same composition and same arrangement of groups as represented in Collie's formula, the synestic preparation of the neighboring xylilic acid was undertaken. The properties of campholytic acid are known, and its preparation by well

known and certain chemical reactions leaves no question as to it containing the camphor residue intact.

The tetra-hydro derivation of the neighboring xylilic acid would have the same percentage composition and an identical internal arrangement of groups as in the formula for campholytic acid as proposed by Collie. Its preparation then, with a study of its properties and a comparison with the properties of campholytic acid would prove or disprove conclusively this structural formula for camphor.

In our work, as a basis for preparation of the acid, pure meta xylene was used, and the steps of synthesis passed through were the dinitro, nitro-amino, neighboring mono-nitro and mon-amino xylenes, the neighboring xylilic nitrile and acid, amide, and finally the neighboring xylilic acid. In the end a compound was obtained which upon analysis proved to be a derivative rather than the acid itself, the quantity being too small to admit of further work toward the campholytic acid isomer.

Seven hundred grains of meta-xylene was used which resulted in the end in twenty-five hundredths of a grain of the acid, or a final yield of less than three hundredths of one per cent, which well illustrates the amount of material required for investigation of new subjects when methods and means are not already worked out, and also suggests the amount of time and patience that must necessarily accompany any such work.

DESIGN FOR A HIGHWAY BRIDGE ACROSS THE WABASH RIVER AT THE FOOT OF MAIN STREET.

HARRY J. McDARGH.

In quite ancient times, as well as in the middle ages, bridge building was carried on by that order of priests, the Pontifices, who at first, if not in later times, claimed to have a professional knowledge of things both human and divine. Whatever religious halo they may have thrown around their work has now been dispelled by science through her modern exponents, the scientists, whose greatest pleasure is found in giving their knowledge to the world. Though one can hardly view without some sense of awe the light steel frames which now span most incredible distances and carry tremenduous loads, yet we have no thought of its being superhuman. Economy of money and material has become the chief object in engineering practice, and simplicity and severity the creed. But, as students of the theoretical, rather than the practical side of bridge building, we, who are just ready to take the first step into the business world, have more or less difficulty in adopting the creed as our own. To us the appearance of a structure seems to be of considerable importance. We hope and believe that artistic or æsthetic bridge-designing will become more popular, and think the tide has even now turned in that direction, at least so far as the design of highway bridges is concerned.

Doubtless the future of Terre Haute will demand a more modern and, perhaps, æsthetic bridge to supercede the graceful structure which now adorns the Wabash at the foot of Main street. As we deemed this to be a problem of a practical nature, we chose as our thesis the design of a bridge to be placed upon the old piers, carrying double street-car tracks and paved with asphalt. In short, making such a design as would be desired for the traffic of a large city.

An outline of the manner in which the design was determined upon may be of interest, but, before setting forth the difficulties which we encountered, it may not be out of place to mention the different classes of bridges and trusses, and explain a few of the elementary terms that must be used for brevity. There are three kinds of bridges—first, the suspension bridge, where the roadway is hung upon a cable which is

always in tension; second, the arch, in which the material is continually under compression and for which the piers or abutments must be designed to resist the horizontal thrust of the arch as well as to sustain the weight; third, the truss, consisting of a frame, one side of which takes tension and the other compression. Considering the truss bridges, we have the through bridge, where the road runs between the trusses and near the lower edge, and the deck bridge, where the roadway is carried nearly on line with the top of the trusses. Trusses are discontinuous when the adjacent spans are separate and are cantilevers when the pier is made to act as a fulcrum with the truss balanced upon it.

Having decided that we would attempt the design of the highway bridge, we next made a survey of the abutting property and the old bridge, and then, with the data thus obtained, endeavored to determine what kind of bridge would be suitable. One point to be continually kept in mind was the necessity of a draw-span called for by the government. The draw would necessarily make the structure discontinuous and therefore neither a suspension nor an arch bridge could be used, since the piers of the draw would either be pulled or pushed over. Hence, we must choose a truss. A through bridge had already been designed by the civil engineering class of '91, and this fact, together with the opportunity which a deck bridge affords for the production of an æsthetic design, led us to adopt the latter.

To make the best appearance from Wabash avenue, the bridge floor should rise slightly and be nearly the full width of the street. We have therefore made the width 50 feet, consisting of a 32-foot roadway and two 8-foot sidewalks. To accomplish this, the trusses were placed 35 feet from center to center, being supported by cantilever beams laid across the piers. The approach to the bridge begins at the alley-way between First and Water streets and rises to its maximum height over the railroad tracks at Water street, which are depressed 3½ feet. The bridge floor rises but little higher than this, and as soon as the west abutment and viaduct are reached it begins to descend, requiring a viaduct of 330 feet to reach the highway. Arch bottom chords were desired owing to their more graceful appearance, but these could not be used in a discontinuous truss as the stresses in the chords would be enormous. Hence, the adoption of the cantilever system was the only recourse left us, though the system was undesirable in many respects. Still, it was well adapted to the use of any draw-span. The draw-span caused no little difficulty, the trouble being in designing one which would make the series of apparent arches continuous and have its bracing conform to that of the fixed portion. Above all, it should be easy to operate, and, if possible, should carry the sidewalks, which are often left off in such cases. The design adopted is shown here, and we believe fulfills all the requirements.

The speaker here referred to a large drawing showing one span of the bridge.

We have thus outlined the conditions and reasons which governed us in making the design. The bridge consists of six spans; this being the one adjacent to the draw-span as shown. The next span beyond will be similar and continuous up to this point, where a suspended span is hinged. Then another span like this, and so on.

The cost of the structure has not yet been figured owing, to the lack of time. Moreover, we were afraid the county commissioners might request that we immediately begin construction before we should have the pleasure of first presenting the design to our friends today.

"Where are you going my pretty maid?"
"I'm going to ride my wheel," she said.
"May I go with you, my pretty maid?"
"It isn't built for two," she said.

—*W. P. I.*

TEST OF A COMPOUND LOCOMOTIVE ON THE PEORIA DIVISION OF THE VANDALIA RAILROAD.

JAMES FARRINGTON.

The underlying principle in the construction and operation of machinery by the engineer of today is economy, and the first consideration in an undertaking is the cost.

The most available source of energy for the production of useful mechanical work is coal through the steam engine, and hence, engineers in designing steam engines endeavor to utilize as much of the energy of the coal as possible. This object has been attained, to a great degree, by the use of compound, triple, and quadruple expansion engines. It is a well-established fact that compound stationary and marine engines of large power are more economical than the simple. But where coal is cheap the economy of the smaller engines is questionable.

The fact that large compound stationary engines are more economical led engineers to apply the compounding methods to freight engines, because of the enormous power required of them.

Practical experience has shown that the greater the limits of temperature between which an engine is worked, the more economic it is.

Therefore the steam must be worked from a very high pressure in the boiler to the lowest possible pressure, which in a non-condensing engine is atmospheric pressure. Many difficulties are encountered in doing this in a single-cylinder engine, hence, in the compounding of engines, the steam is admitted to a cylinder called the high pressure and, after it has partially expanded in that cylinder, passes to another called the low pressure, which is in direct connection with the first, thus taking its supply of steam from the first cylinder instead of from the boiler direct. In the high pressure cylinder the area is smaller and the pressure greater than in the low pressure cylinder, the cylinders being so designed as to do equal amounts of work.

Owing to the compactness of the machinery of a locomotive and the necessity of frequent starts and stops, great difficulties are presented which are not encountered in the stationary or marine engines. The utmost ingenuity has, therefore, been exercised by engineers in order to make the compound locomotive a commercial success. The object of our test was to ascertain the performance of the engine, and to obtain sufficient data to allow of a comparison with a simple one.

The test consisted in determining the amount of coal and water used in hauling a train of known weight between Terre Haute and Decatur, Illinois, by the performance of the engine, the power developed, and the performance of the engine in general, and, if possible, to determine the perfection of design and operation.

To obtain these results new devices were employed. The power developed in the cylinder can be obtained by the use of a simple indicator, by knowing the average pressure of the steam on the piston and the distance through which it is moved. This is done by permitting the steam working in the cylinder to communicate its pressure to the indicator piston, compressing a spring of known strength, the amount of motion of the spring being proportional to the pressure.

This motion is recorded by means of a pencil upon a card wound upon a cylinder, the motion of which is proportional to the motion of the piston at any position of its stroke.

There is thus drawn a diagram representing both the steam pressure and piston motion of the engine, from which the power of the engine can be computed. The cards also give the working of the valves.

From such cards we are only able to calculate the power for one stroke or half a revolution of the drivers, hence, to determine the total power developed on a long run we would be required to take twice as many cards as the engine makes revolutions, which is at once seen to be practically impossible. To overcome this difficulty an indicator which summed up these cards, so to speak, was used. This indicator, known as a continuous

integrating indicator, was designed and built at the Rose Polytechnic Shops, and, as far as we know, was used for the first time in a locomotive test. Two of these indicators were used: one for the high pressure and one for the low pressure cylinder, and we may add, that a locomotive cannot be thoroughly tested without the use of this kind of indicator.

As an example of the enormous work done by an engine, we take the case of an engine hauling 35 cars, weighing 1,727,850 pounds, from Terre Haute to Decatur, a distance of 94.4 miles.

The work done by the high pressure cylinder was 28,450,000,000 foot pounds, and by the low pressure cylinder 35,600,000,000 foot pounds, giving a total of 64,050,000,000 foot pounds, equivalent to the work done in lifting 6,065 tons a height of one mile.

In order to operate the indicators we were required to be as near the cylinders as possible, and for that purpose, two boxes about the size of dog-houses were built—one in front of each cylinder. In these boxes we spent from five to ten pleasant hours at a time. The pleasure was only marred occasionally by the appearance of a cow or horse on the track, or by a shower of hot water and soot from the smoke-stack.

We also tested the temper and disposition of the engineer and fireman and, judging from the courtesies extended to us by them, they stood the test well.

We were able to make this test through the kindness of Mr. Benj. McKeen, superintendent of the Peoria division of the Vandalia Line. We were assisted by Prof. Brown and Mr. Benj. Grosvner.

TEST OF A GAS ENGINE, SOLDIERS AND SAILORS MONUMENT, INDIANAPOLIS, IND.

ORANGE E. McMEANS.

In all ages man has been dependent upon powers and forces other than those resulting from his own bodily exertion when he wished to accomplish any but the most simple of tasks. The progress of civilization, in fact, may almost be traced by the development in the means whereby the forces of nature may be made to serve the purposes and supply the wants of the human family. Such development has in the course of time taken place in various directions, as different methods of tapping nature's great supply of energy have been discovered. The very earliest example perhaps is to be found in the use of animal power, and the reason is evident in the ease of application of such forces.

The use of the steady, reliable river current and of the shifting, variable winds as an aid in the transportation of freight, was also comparatively easy and consequently dates from prehistoric times. The application of the same forces to the turning of machinery in stationary structures, such as mills, came later but is still very ancient. Coming down to modern times, the discovery of the steam engine marked an epoch in the history of prime movers. The high degree of improvement and wide-spread application which have been given to it have caused it to overshadow almost entirely all other sources of power. But it is not without rivals by any means. The water wheel still occupies a well marked position as a mover of the world's machinery. We cannot overlook such great enterprises as those at Niagara and Austin, Texas. Another rival, somewhat weaker, but none the less firmly established in its own peculiar field is the gas engine. It has many advantages which recommend it for certain situations and the more these are understood the greater will be the extent to which it is used.

Some experiments with an engine of this kind form the subject of the present paper and as introductory it may be well to review briefly the principles upon which its action is based.

The gas engine is a device for utilizing a force which is only too well known from its terribly destructive effects when manifested in the form of accidental explosions. In these cases the artificial or natural gas leaks from pipes into cellars or other enclosed spaces and becoming diluted with a large proportion of air, forms a highly explosive mixture. It only waits for the introduction of a lighted lantern or candle to arouse its slumbering strength and tear to fragments anything in its path. As the wild, and seemingly resistless fury of the great cataract has been subdued by the hand of man and it, like Sampson, been compelled to grind peacably in the mill, so in the gas engine we find a successful attempt to place in harness that, which, when uncontrolled, is a most powerful agent of destruction.

In the common form of the engine we find the usual cylinder with its tightly fitting piston. Into one end of this cylinder a charge of gas and air mixed in the best proportion for combustion is admitted. By means of an electric spark the mixture is set on fire and the resulting explosion drives the piston outward. A connecting rod and crank transforms this sliding motion of the piston into rotary motion suitable for driving machinery. As may be imagined, since the cylinder is practically the furnace in which the fuel is burned, it would become heated to a high temperature in a short time. To prevent this and allow the piston to work freely, the cylinder is surrounded by a hollow space or jacket through which a current of cold water is carried. This of course removes a large amount of heat which is entirely wasted so far as the engine is concerned. It forms, in fact, one of the principal sources of loss in the working of the engine. The field in which the gas engine finds its greatest usefulness is in the production of small amounts of power in isolated places, such as residences, office buildings, and the like. The peculiar advantages which lead to its employment in such situations are:

1. It is always ready for use at a moment's notice without any firing up.
2. It is economical even in the smallest sizes.
3. There is little or no danger from accidental explosion, since there is no boiler carrying a large reserve supply of energy.
4. Very little care or attendance is necessary, a special engineer not being generally required.

The particular engine upon which the tests in question were made is one of three located in the basement of the Soldiers and Sailors monument at Indianapolis. They are used for the purpose of driving three dynamos, the current from which in turn is used to light the monument and vicinity, to run the elevator which carries passengers to the top of the shaft and also the pumps which supply the fountains at the base. Visitors are usually quite surprised to find such an extensive power plant installed there. Each of the engines is of thirty-horse power, making ninety-horse power in all.

The purpose of the test which was made upon engine No. 2. was to find how much work was developed from the gas and, also, to determine the manner and extent of the losses of energy. To do this the following observations were undertaken:

1. Measurement of the quantity of gas consumed.
2. Measurement of the volume of air used in the combustion of the gas.
3. Determination of the heat lost through the water jacket.
4. Determination of the heat carried off in the exhaust.
5. Measurement of the actual useful work developed by the engine.
6. Chemical analysis of the gas used for fuel and calculation of the heating value of the same. Also the analysis of the exhaust gases.
7. The application of a special gas engine indicator of the continuous type, to show the action of the engine so far as the operations occurring in the cylinder were concerned, and to measure the energy generated by the explosions.

All of the apparatus used was made at the Institute shops, shipped to Indianapolis and set up at the engine especially for the purpose of making the test. The observations were made during a series of runs of 20 to 30 minutes duration each.

The engine was started up under a certain desired load, allowed to run for a few minutes until everything was working smoothly and then the necessary readings of instruments were taken.

The gas used was measured by means of an ordinary 50-light meter connected in the pipe to the engine.

The measurement of the air was effected by the use of a large galvanized iron drum connected by a 3″ pipe to the air supply valve of the engine. Around the side of this drum were tubular openings made of ½″ gas pipe, some 25 in number. Any number of these openings could be corked up or left open as desired. The back pressure or suction was measured by means of a glass V tube filled with water. The rate of inflow of air through the tubes for different pressures was found by experiments in the Institute shops with a gas meter and centrifugal blower.

In order to measure the heat lost in the water used to cool the cylinder, the water was allowed to discharge into a barrel on an ordinary platform scale. The weight was noted at five-minute intervals and the temperature of inflow and outflow measured.

An attempt to measure the heat lost in the exhaust gases failed entirely through the lack of an instrument capable of measuring the high temperature produced. The mercury in a Centigrade thermometer reading to 450° boiled at every trial.

The actual work produced by the engine was measured by means of a rope brake applied to one of the fly wheels. This consisted of a pair of one-inch ropes passed entirely around the wheel and attached to one end of a wooden lever hung from a frame resting on the floor. On the other end of this lever iron weights were hung until the desired tension in the ropes was obtained. In this way the full power, or any fraction of it, of the engine could be developed.

An analysis of the natural gas used for fuel was made by Mr. E. B. Harris using the Orsat apparatus. Analysis of the exhaust gasses were also made for each separate run as the composition was found to differ with different loads on the engine.

The special engine indicator used to record the action in the cylinder was designed for the purpose and made in the Institute shops. It embodied a number of novel features, the most interesting of which is the way in which the record was made. As in the ordinary steam engine indicator, a small piston attached directly to the main cylinder was connected with a pencil point which moved up and down as the pressure in the cylinder rose or fell. In front of this pencil was passed a long strip of paper moved by a connection with the engine shaft so as to follow in miniature the motion of the main piston of the engine. Thus the cylinder was made to write its own record in the shape of a continuous wavy line showing the pressure against the driving piston at each instant in every stroke. Some interesting features in the performance of the engine were well shown by this record, one of which was the action of the governor in cutting off the gas supply when the speed became too high, thus preventing the occurrence of an explosion.

From the exact results obtained in the test, which have been prepared in tabulated form, the following have been taken as of some general interest. The practical efficiency of the engine or the actual work delivered as compared with the total heat supplied in the fuel, varied from 9 % to 15.4 %, the lower figure being obtained when working at light load. This compares very favorably with the efficiency obtained from steam engines. The percentage of the total energy which was lost as heat in the cooling water of the jacket was found to be from 25 to 40, that is in the worst case nearly half of the energy in the fuel was wasted in simply heating the water around the cylinder. The volume of gas used was shown to be from 15 to 28 cubic feet per effective horse power hour, or an average for all the tests of about 22 cubic feet. Taking the price of gas at 50 cents per 1,000 cubic feet, we have the cost of the fuel as 1.1 cents per horse power hour, or 11 cents per horse power for the working day of ten hours.

ALUMNI ADDRESS.

Delivered by JOHN B. AIKMAN, '87, Rose Polytechnic Commencement, Thursday June 18, 1896.

Something over a year ago, Dr. Mees, the honorable president of this institution, conceived the idea that an address from a member of the Alumni Association would be a desirable feature to include in the commencement exercises.

Those of you who were present on this occasion last year, will remember how admirably this duty was performed by Hon. Francis T. Hord, of the class of '88, and will not be surprised that Dr. Mees felt encouraged to continue this feature of the exercises.

The choice of speaker was assigned to a committee consisting of the officers of the Alumni Association.

Through some remarkable eccentricity of judgment, I was selected by the committee to appear before you to-day on behalf of the Alumni.

It is perhaps appropriate for me to state, incidentally, that at least one official of the Alumni Association voted *against* this selection—I refer to the secretary and treasurer.

This much by way of apology for my appearance before you.

However, I appreciate the honor thus conferred upon me, and will endeavor to discharge the duty to the best of my ability, relying upon your generosity to overlook any imperfections that may present themselves.

The Rose Polytechnic Institute was opened, as most of you know, in March, 1883.

It occupied a unique and conspicuous position in the educational world.

It was the first or pioneer institution in the West to give actual machine shop practice the dignity of an integral part in the course of instruction. Some institutions had a very insignificant collection of lathes and unimportant machinery, prior to that time, but none of them pretended to give this feature any prominence in their courses of study.

For several years after its opening no other school in the West was equipped with a machine shop that could be at all compared with this one.

At the outset the board was particularly fortunate in securing the services of the late Dr. Charles O. Thompson as President. He came to us from Worcester, Mass., where he had previously organized and thoroughly established the Worcester Polytechnic Institute, which offered courses of study almost identical with those he arranged here.

The eastern institution I have mentioned was the very first in the United States to give actual shop practice such an important place in engineering training.

The Rose Polytechnic was naturally modelled by Dr. Thompson very much after the institution which he had previously organized so successfully.

The wisdom of his views on this form of education has been confirmed in a manner reflecting great honor on his name—not only by the pro-

nounced success of the two institutions he established, but by the wonderful growth in popularity throughout the country of this plan of education.

At present there is a very large number of institutions throughout the United States equipped with machine shops and other appliances of similar nature and all give these departments special prominence in their courses.

Most of them are modelled after the plan of this one.

The first class organized was that of '86 and I am sure this institution will never be able to turn out a class that will be more creditable to her.

In September of the same year the class of '87 was organized, of which I had the honor to be a member.

Three young men who had previously studied under Dr. Thompson at Worcester, Mass., entered at the same time and constituted the first junior class, or the class of '85.

September, 1883, therefore found the Rose Polytechnic Institute supplied with three classes, with the finest machine shop of which any educational institution in the West could boast, and a faculty, which, though hardly complete in numbers, could not be surpassed in ability.

The subsequent four years were those spent by my class in the Institute and the development of the latter in all directions was very rapid.

All went well until the 17th of March, 1885, when the Angel of Death laid his hand on the form of our beloved President, whose name I have already mentioned.

The shadow of gloom cast over the school by this great sorrow was indeed impenetrable.

He had not been spared to us long, but long enough for every student to love and honor him.

Never can the memory of this cultured and noble man fade from the hearts of the Alumni who had the honor of sitting at his feet in search of knowledge.

For a year and a half after this sad event the Institute was without a president.

The highly satisfactory manner in which the work was carried on under such a serious disadvantage is a lasting tribute to the ability, good sense and spirit of harmony that prevailed in the faculty.

Dr. T. C. Mendenhall was then made president.

It did not take long for us to discover the splendid intellectual equipment with which this gentleman was endowed.

The rare culture and high scientific attainments, together with the unassuming and genial nature which he brought to the discharge of his duties, installed him immediately in the affection and lofty esteem of all the students.

Under his direction all departments here immediately began to improve.

At the close of his first year—June, 1887—the class of which I was a member finished their course and received their degree.

Since that time the rapid advancement of this institution has been uninterrupted.

The departments of civil, mechanical and dynamic engineering have been practically built up within this period.

Apparatus for scientific investigation in the electrical and physical departments has been added to the value of $10,000; in the department of chemistry, $2,000; in the department of mechanical engineering, $5,000, and of civil engineering, $3,500. Most of that for the two latter departments was designed and built here in the institution.

Among these may be mentioned the following, designed by Professor Gray and constructed in the shops under his direction: A journal testing machine for testing different kinds of metals and lubricating oils used in journals; a continuous steam engine indicator—something entirely new in this line and a vast improvement over the types of indicators heretofore used; a torsion testing machine to show the power required to twist a bar of iron or any other metal into two parts.

Others of great value and ingenuity might be mentioned if time would permit.

The faculty has been increased by the addition of men of the widest reputation for attainments in their respective lines.

The study of photography has been added to the drawing department, and finally the long

cherished hope of students, faculty, and alumni has been realized in the erection of this handsome gymnasium, than which nothing was more urgently needed.

The funds required for its erection were supplied by contributions from the students, faculty, alumni, and a loan kindly advanced by the Board of Managers.

On behalf of the alumni I congratulate the management of the institute on this remarkable advancement that has been made since the year 1887.

This interval is coincident with the life of the Alumni Association. It was organized on commencement day of the year just mentioned, Mr. Benjamin McKeen, '85, being elected its first president.

The meeting and banquet were held in the Terre Haute House before it was rebuilt. It was a complimentary affair kindly tendered the faculty and graduates by the Board of Managers.

Since that time the Alumni Association has given a banquet and held a business session every year on commencement day and the interest and pleasure connected with these reunions has steadily increased.

It started with a membership of twenty-seven, which has increased to 163, not including the class of '96.

In the early part of its existence it was unable to render the Institute any special service.

It required some time for the members to understand the real functions of an Alumni Association. Therefore no one was prepared to suggest any definite plan of action that might benefit the Institute. Besides, the members had hardly attained sufficient age, experience or influence to accomplish much in this direction.

Of late years, however, both have come to realize that a spirit of co-operation between them is essential to their mutual prosperity.

The judgment of the graduates has been ripened by experience, and contact with the world. Practical work in their professions has developed practical ideas, and enabled them to see clearly the features of their training here that were beneficial as well as those that were not.

The association holds its tenth annual meeting this evening. It is old enough to begin to show some results that will redound to the benefit of its parent institution.

Indeed our responsibility to the Institute as alumni is far greater than it was as students.

In the former relationship we represent to the world its *finished product*. If our career be fruitful and full of honor we will reflect credit upon her. If we fail in this obligation—she must suffer.

As students the duty was more properly to ourselves, and failure to perform it was our own loss and not that of the school.

Students of Rose that persist in such indifference to duty generally drop by the wayside at the end of examination season and relieve her of turning out graduates of doubtful capacity.

The standard of excellence here, fortunately, is high—so that it is safe to assume that a student has been faithful to his duties when he receives his degree.

Some, however, are led by their personal preferences for certain branches to give others, that do not harmonize so well with their taste, less attention than they deserve.

No student can tell which of the scientific branches taught here he will use most in his future work.

More than one graduate has had occasion to regret this mistake. I know one who gave the least possible attention to chemistry while here because he did not particularly like it. Contrary to his expectations he found himself in after years engaged in a business wherein a knowledge of chemistry was far more important to him than any other subject he studied.

It is unsafe for a student to slight any subject whatever that belongs to the course he is taking.

The Rose Polytechnic Institute, up to the present time, has had no occasion to feel ashamed of her offspring as to their character or the work they have accomplished.

Her reputation as an engineering school has been remarkably sustained by the alumni.

Out of the 163 graduates, 120 are engaged in actual engineering work; eleven are teachers of branches connected with engineering; nine man-

age business enterprises wherein engineering knowledge is essential; five are attorneys giving special attention to patent laws; one is a scientist; another a post-graduate student of scientific subjects, making 147 in all who make use continually of the special training received here.

Of the remainder nine are in commercial establishments in which scientific knowledge is not directly essential, but nevertheless very useful in many unexpected ways, as I can say from experience; two are farmers; another a teacher of subjects not related to those taught here; two have no special occupation that we know of, and only two out of the entire number have been claimed by death.

A careful examination of statistics reveals the fact that relatively a larger percentage of the Rose graduates are engaged in engineering work or occupations closely related to it than of any other technical school in the United States.

The Alumni Association naturally feels proud of this showing and is very anxious that it be maintained.

The growing interest among its members in everything that concerns the Institute's welfare is an indication that they have a proper conception of their duty to her.

Our annual meetings are looked forward to with enthusiastic pleasure and furnish strong inducements for the older graduates to occasionally return and mingle with classmates and friends in the faculty.

Interest in the school is thus greatly stimulated in those who return and the institute and its alumni are brought into closer sympathy every year.

The Rose Tech Clubs that have recently been organized in the cities of Chicago, St. Louis, Pittsburg and Indianapolis furnish additional evidence of the desire in the alumni to preserve and strengthen the connection between them and the Institute.

The Rose graduates residing in the cities mentioned constitute the membership of these clubs.

They meet every two weeks and present papers on subjects of professional interest. These are discussed as well as matters pertaining to the relations between the alumni and their *alma mater*.

The management of the Institute has not been indifferent to its duty in bringing about this spirit of unity and co-operation.

Within the past year it has seemed to recognize more fully than ever before the importance of fostering this alliance.

This has been conspicuously shown by the liberal attention given to the matter by the President and Board.

Through the efforts of the president we are more frequently reminded of the interest which the Institute retains in us.

We are being made to feel that we have some share in its operations. Naturally the effect has been to greatly revive our interest in its work, and excite our gratitude for the consideration shown us.

No occasion so appropriate as this could be found on which to mention in detail some of the steps which have been taken along this line.

The incorporation of an alumni address in the commencement programme—as I have already intimated—is of recent occurrence. It is a graceful and honorable recognition, in a public way, of the association which is especially pleasing to its members.

Mention was made by Mr. Hord, in his address at the commencement a year ago, of the feeling existing among the graduates that some scheme of representation from their members on the board of managers would be desirable to them, and of benefit to the institution.

Being an engineering school it was felt that its graduates who had for some time been engaged in professional work would be specially qualified to advise along some lines at least as to the best interests of the school.

This desire, it gives me pleasure to state, has been met to some extent through the kindness of the board of managers. They have extended to the alumni an invitation to annually appoint a committee of three members whose duty it shall be to make an official visit to the Institute during commencement week as an advisory committee to the board of managers and faculty in matters per-

taining to the Institute's interest. They are to make a thorough examination of the Institute in all its departments and submit such suggestions and recommendations as they consider advisable in their report to the board of managers, with whom they will have the honor to meet in joint session.

It will be regretted by the alumni that this invitation reached their secretary too late to comply with the conditions it imposed for putting it into operation this year.

This action of the board will, I have no doubt, be highly appreciated by the alumni.

They of course will not regard it as intended for a compliance with their desire for representation in the capacity of full membership on the board. This, the alumni feels, will be granted on the first opportune occasion.

It shows that the board appreciates the value of the alumni's co-operation and desired to avail themselves of it more promptly and in fuller measure than could be secured by waiting until it is possible for them to elect a graduate to full membership in their body.

The President of the faculty has also honored the alumni by selecting several of its members to serve on a committee to examine in detail the theses and work connected therewith which the young men of the class of '96 have submitted to the faculty.

The selection is made from men actively engaged in the different professions represented by the theses.

Their approval of the latter has been made one of the requisites of their acceptance by the faculty.

They have been occupied with this work for the past three days, and report that the exhaustive work and valuable results attained as revealed in the original theses is but very imperfectly manifested in the creditable showing which the gentlemen of the class of '96 have made before you this morning.

These important changes cannot fail to operate greatly to the mutual benefit of Institute and its alumni.

They provide exceptional opportunities for us to keep ourselves informed of the changes and improvements going on here.

We are thus led to turn our attention from our daily routine work and give some thought to the affairs of our beloved *alma mater*.

Remembering what a large percentage of the Rose graduates are engaged in the professional lines that are taught here, it is hardly presumptuous for me to say that their continued reflection on these matters must result in valuable suggestions to the management.

I would not have what has been said construed as a criticism from the alumni of the manner in which the Institute's affairs have been conducted. Far from it. We feel that they have been admirably managed.

Rarely is there to be found a body of men so conscientious in the discharge of a trust confided to them as the board of managers of the Rose Polytechnic Institute have been.

Since the day when Chauncey Rose—to whose noble generosity we are indebted for this splendid enterprise—placed in their hands the task of carrying out his desires, they have worked faithfully and devotedly to bring the Institute to its present high position.

Remarkable business sagacity, the wisest conservatism, and the most careful judgment has characterized their every step.

Their only compensation has been the satisfaction they enjoy in seeing the Rose Polytechnic Institute in the front rank of the leading educational institutions of the country.

The sentiment in the alumni to which I have alluded is purely inspired by their affectionate interest in the institute.

Here were spent four of the happiest years of each member's existence. Here was laid the foundation on which each is striving to erect his fortune or success in life.

This place is full of associations dear to every alumnus. We therefore love this splendid institution and heartily rejoice in her progress.

May she continue to go forward adding new laurels to her honored name and may the wise

hands that now guide her be spared for many years to come.

Let us as alumni not forget that though we may render her valuable service along the lines that I have mentioned, yet after all, this will amount to nothing—unless we reflect that glory on her fair name that can only come from the development of high characters within us and the accomplishment of results which shall be of value to the world as well as ourselves.

THE ALUMNI BANQUET.

The ninth annual alumni banquet was held at the Terre Haute House in the evening of Commencement Day. Promptly at nine o'clock forty-three persons sat down at the long table in the dining room. At the head were seated President V. K. Hendricks, '89, and Secretary John B. Aikman, '87. Next to them on the left were the members of the Board of Managers and Faculty who were in attendance. Then in order came the members of the various graduating classes all being represented except '92. The following menu was enjoyed by all present:

MENU.

Salted Almonds.

Bouillon in Cup. *Amontilado.*

Radishes. Olives. Pickles.

Caviar Sandwiches.

Fried Filet of Trout, Tartar Sauce.
Pommes Duchess.

Braised Sweetbreads. *Cruse et Fils Claret.*
Stuffed Tomatoes. New Green Peas.

Polytechnic Punch.

Broiled Spring Chicken. *Champagne.*
Saratoga Chips.
Chicken Salad.

Ice Cream and Cake.
Cheese and Crackers.
Watermelon.

Coffee. Cigars.

Mr. Hendricks as toastmaster fulfilled his duties admirably. His responses were full of wit and humor and caused much merriment. The first toast was given by W. C. Ball on behalf of the Board of Managers. President Mees followed representing the faculty. The responses from the classes which came next were full of interesting and funny incidents. Among those related were some amusing happenings to members of the different classes during the past year. Mr. Foltz, '86, presented perhaps the brightest and wittiest speech of the evening. He spoke of how his class came to Terre Haute in prairie schooners and found the Polytechnic in the midst of a dense wilderness; how they blazed the path from the town to the campus in the clearing; and how each man's standing was determined not by his excellence in scholarship but by the number of scalps at his belt. The intensity of class spirit which existed was quite evident as each speaker seemed to take for his text, "we are *the* class."

Mr. W. C. Ball made the suggestion to the graduating class that each member subscribe to a fund to purchase a silver cup; this cup to be presented to the first son born to a member of the class. He added that all who were married before graduation should be barred. The suggestion was taken under advisement.

Those who responded for their classes were: Benjamin McKeen, '85; Herbert W. Foltz, '86; John B. Aikman, '87; George M. Davis, '88; William R. McKeen, '89; Mason Galloway, '90; Samuel S. Wales, '91; Warren Hussey, '92; Arthur M. Hood, '93; Fred F. Hildreth, '94; Arthur V. Tuller, '95, and William E. Burk, '96.

ALUMNI BUSINESS MEETING.

The business meeting of the alumni was held in the afternoon at 3 o'clock at the Terre Haute House. Geo. H. Chapman, '88, of Eau Claire, Wis., was elected president; Howard M. Stanton, '94, of Indianapolis, vice-president; John B. Aikman, '88, of Terre Haute, secretary and treasurer. The members of the executive committee for the ensuing year are Fred F. Hildreth and Benjamin

McKeen of this city and Herbert Foltz of Indianapolis.

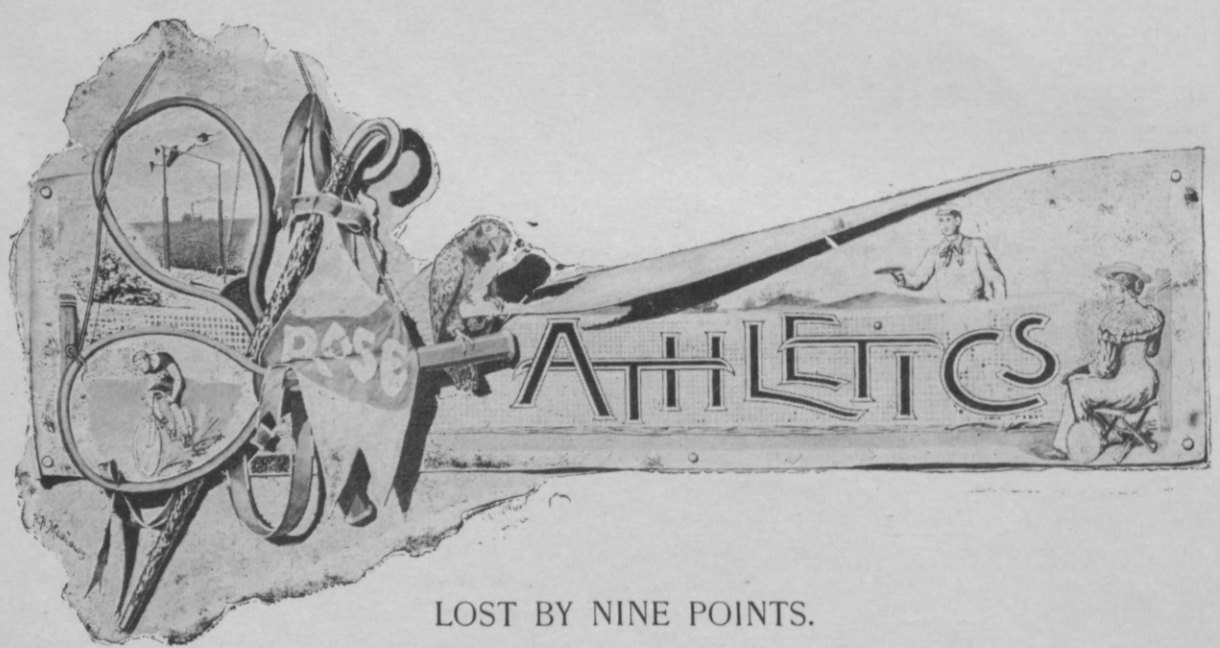
The executive committee was instructed to revise the by-laws and constitution during the coming year and report at the next meeting. A communication from the board of managers was read inviting the alumni to appoint a committee of three to visit the institute during next commencement in the capacity of an advisory body. All present were well pleased with the results of the meeting.

ALUMNI NOTES.

We are in receipt of the card of Miss Lucile Wilkin, May 12, 1896, daughter of Mr. and Mrs. John T. Wilkin, '86.

Robinson, '94, has taken the position of second assistant to the engineer of maintenance of way on this division of the Big Four.

The marriage of S. B. Tinsley, '91, to Miss Atalanta Owens, of Louisville, Ky., will occur on Tuesday evening, June 30th, at 5:30 o'clock, at the home of the bride's mother, Mrs. A. E. Owens.



LOST BY NINE POINTS.

After one of the hardest fought and most exciting contests in field sports ever witnessed between Indiana colleges, the final score on May 29th showed Purdue to be nine points in the lead and for the first time in five years R. P. I. was obliged to stand back and see the pennant for the championship of field sports go elsewhere.

To those who had carefully reckoned our strength before hand, the defeat did not come as a surprise but as an unpleasant realization of a very possible contingency, for it was well known to everyone that the pennant would be won on a very small margin, which margin was a very uncertain quantity.

The Rose delegation which went to Lafayette was not as large as that which cheered the boys on at Indianapolis two years ago, but they were not backward in the old-time enthusiasm and they made up in noise what they lacked in numbers. There was a continuous display of enthusiasm from the time of departure from Terre Haute early in the morning until almost the final event at the

fair grounds at Lafayette in the afternoon, at which time it was realized that our chances for winning had vanished and, very naturally, the enthusiasm subsided.

The tennis events were called promptly at 10 o'clock in the morning, but as there were four entries for singles and three for doubles in this, they were not finished until nearly the middle of the afternoon. The doubles were won by Farrington and Meriwether quite easily, but the singles proved long hard contests in every case and the contestants were pretty thoroughly tired out before the concluding game was played. The final contest was between White, of Earlham, and Farrington, R. P. I, and was a very pretty exhibition; Farrington winning at the end of four sets.

The crowd assembled at the fair grounds in the afternoon was sufficient to encourage almost any managing committee, and interest in the contest did not flag until the very last.

The 100-yards dash proved a disappointment in some respects and a surprise in others. It was naturally expected that Buschman, who holds the state record ef 10 seconds, would again take first place but the result of the final heat was: Casselman of DePauw, first; Beckman, P. U., second; Buschman, P. U., third. Time, $10\frac{4}{5}$ seconds. The low record is accounted for by the fact that the dash occurred in the face of a stiff breeze.

There were a number of records broken during the course of the afternoon. The most remarkable one was that of Ewry, of Purdue, in the standing high jump, who raised his previous (State) record of 5 feet 2 inches by an inch and a half and also broke the *World's* amateur record for this event. Not satisfied with a single record like the above to his credit, Ewry next proceeded to smash the standing broad jump. This was also increased by one and one-half inches and his present record of 10 feet 8 inches is within one inch of the Intercollegiate record.

Almost as startling as the above record of Ewry's was the manner in which the time for the mile walk was pulled down. Shaver, R. P. I., who held the record from last year on 8 minutes 2 seconds, simply outdid himself, going the mile in 6 minutes $56\frac{4}{5}$ seconds, which is but four seconds short of the Intercollegiate record.

The Klingers took the bicycle races as usual; the half-mile, previously held by P. W. Klinger on 1 minute 9 seconds going to W. J. Klinger on 1 minute $7\frac{3}{5}$ seconds. The one-mile race, however, was a perfect farce, the only redeeming feature being a very pretty finish. An idea can be formed of the amount of jockeying which was done for pace-maker by reference to the record—3 minutes $13\frac{4}{5}$ seconds.

The record of 9 feet 11 inches for the pole vault remained intact, although McMeans made three desperate attempts to break it on 10 feet.

The next record to suffer a change was the high kick, Ewry again adding to his laurels by so doing; his previous record was raised by one inch. Jones, of Earlham, pulled down the time on the quarter-mile run to $52\frac{3}{5}$ seconds, almost two seconds lower than the previous I. I. A. A. record.

In the first preliminary of the 120-yards hurdle, Ristine of Wabash broke the state record of $18\frac{2}{5}$ seconds, but unfortunately in the final he fell almost at the outset, thus losing the opportunity for holding the I. I. A. A. record for this event for at least a year. The time for the one-mile run was lowered from 4 minutes $53\frac{2}{5}$ seconds to 4 minutes $47\frac{4}{5}$ seconds by Green, of Purdue, whose finishing sprint was excellent and rather different from the finish of the majority of the contestants after such a hard mile.

One of the most interesting and exciting events of the afternoon was the last one—the running high jump. The final contestants in this had taken part in previous events and were somewhat tired to begin with. It seemed to be the opinion of the majority of those present that this event was the critical one of the afternoon, as the race for the pennant had been pretty even up to this point, consequently the efforts of the various contestants were heartily cheered by their respective admirers. Robertson of Purdue succeeded in clearing the bar at 5 feet $5\frac{1}{4}$ inches; Haworth, of Earlham, who holds the state record of 5 feet 6 inches taking second place. Ewry added another point to his record by taking third place.

The Pentathlon was won by Bateson of Purdue. The events, together with positions and winning record, are here given with trial heats omitted:

Event.	Winner.	College.	Record.	Second.	College.	Record.	Third.	College.	No. of Contestants.
100-yards dash	Casselman	D. P. U.	0:10¼	Beckman	P. U.		Decker	R. P. I.	9
Standing high jump	Ewry	P. U.	5 ft. 3½ in.	Liggett	R. P. I.		Robertson	P. U.	6
Putting 16-pound shot	Roller	D. P. U.	36 ft. 9½ in.	Kercheval	P. U.		Robertson	P. U.	8
Standing broad jump	Ewry	P. U.	10 ft. 8 in.	McLellan	R. P. I.		Liggett	R. P. I.	9
One-mile walk	Shaver	R. P. I.	6:56⅘	Reese	P. U		Pierson	R. P. I.	5
One-half-mile bicycle	W. J. Klinger	R. P. I.	1:07⅗	P. W. Klinger	R. P. I.		Good	P. U.	8
Pole vault	McMeans	R. P. I.	9 ft. 10¼ in.	Crebs	R. P. I.	9 ft. 4 in.	Stokesberry	I. U.	7
220-yards dash	Beckman	P. U.	0:23⅗	Casselman	D. P. U.		Jones	E. C.	6
Hop, step and jump	Hester	E. C.	43 ft 2½ in.	Haworth	E. C.				6
120-yards hurdle	L. A. Test	P. U.	0:19	Hellweg	R. P. I.		Ristine	W. C.	5
High kick	Ewry	P. U.	9 ft. 3 in.	Haworth	E. C.		Schwed	R. P. I	6
Throwing 16-pound hammer	E. Alward	P. U.	105 feet	Buschman	P. U.		Hubbell	R. P. I.	5
Running broad jump	Hester	E. C.	19 ft. 5¾ in.	Ristine	W. C.		Jumper	R. P. I.	7
440-yards dash	Jones	E. C.	0:52⅗	Beckman	P. U.		Cassady	P. U.	5
One-mile bicycle	W. J. Klinger	R. P. I.	3:13⅘	P. W. Klinger	R. P. I.		Stout	E. C.	8
Running high jump	Robertson	P. U.	5 ft. 5¼ in.	Haworth	E. C		Ewry	P. U.	6
One-mile run	Green	P. U.	4:47⅕	Hester	E. C		Fröelich	R. P. I.	9
Tennis doubles	Farrington, Merriwether	R. P. I.							
Tennis singles	Farrington	R. P. I.							
Pentathlon	Bateson	P. U.							

	Firsts.	*Seconds.*	*Thirds.*	*Points.*
P. U.	9	5	5	65
R. P. I.	6	6	7	55
E. C.	3	4	2	29
D. P. U.	2	1	0	13
W. C.	0	1	1	4
I. U.	0	0	1	1

NOTES.

The visiting students were treated to a drama in the evening. It was given by the Senior class of Purdue and, considering the fact that it was gotten up on short notice, it was very creditable to them. The award of medals occurred at the opera house previous to the entertainment.

The Polys had a variety of new yells on hand for the occasion and succeeded in attracting the usual amount of attention by their use. Their enthusiasm showed itself in so many different ways that an onlooker was heard to remark that "those Polytechnic boys do beat anything."

Crebs surprised himself and everyone else by his success at pole vaulting. He had never reached the nine-foot mark while training, thus showing what strong effort and excitement will do for a man at times. When he quit at 9 feet 4 inches it was only because he was assured of second place and wished to enter another event.

The record for the one-mile bicycle race was a disgrace to its name and should not be called as such. The pace up to the last quarter was so slow that anyone not informed that a race was in progress would have thought it a pleasure ride.

Our loss of the Pentathlon was probably due to an unfortunate accident to Ridgley. While pole vaulting he strained his ankle severely, and soon after the start in the mile run it gave out on him completely, compelling him to drop out and thereby forfeit any claim in the contest.

A rather unusual thing occurred in the running high jump. All of the three contestants who were trying for second place failed on 5 feet 4½ inches, so after Robertson had cleared at 5 feet 5½ inches the bar was lowered to 5 feet 4 inches and all three cleared. Again it was raised to its former place and, to the surprise of everyone, after three desperate efforts each one of the three went over and it was put up another half inch.

A TRAINING TABLE.

Do we need a training table? is a question which has been asked many times in the last three years.

If we consider the example of other and larger institutions as at all worthy of imitation in this particular, there is no doubt but that we need a training table and need it badly. Scarcely a college in this country has not this accessory to ex-

cellence in athletics and indeed no college of any prominence would consider for a moment participation in football or baseball or track athletics, had not its men by a course of rigorous training, both in the field and at the table rendered themselves fit for such exercises.

The idea of a training table is to give the men good wholesome food and plenty of it. It is next to impossible for a candidate for a football or baseball team to refrain from eating the pastries and other so-called goodies which invariably appear at meal times, and whose usual effect is to make the men, not the table, groan under their weight. And truly the average Rose Tech athlete seldom denies himself in this respect, unless he be an extraordinarily conscientious one, and this type of individual as we all know is sadly minus here.

At the training table the men are usually under the eyes of their captain who, if he be the right sort of fellow, will see that the laws of eating are duly respected. If pies and cakes are absent, the desire to partake of them is also gone, and not in a " sour grapes " sense, either.

The value of eating good food, well prepared, and temperance in the use of, or total abstinence from pastries, tea and coffee is too great to be ignored when it is one's intention to participate in such an active game as football. And the sooner we realize this the better it will be for each one of us individually, and for school athletics generally.

That men should be in the finest of condition before going into a game of football or baseball or into athletics or gymnastics of any kind is too well known a fact to be denied, and to be in this condition systematic and rigorous training and dieting are absolutely essential. When all other schools are endeavoring by every manner of means to put their men into the best shape, it will not pay us to let our men train in the slipshod manner of past years—each man for himself and nobody for us all.

The objection might be raised that the scheme being a new one here, no one would be willing to undertake the task of starting the table, but the almighty dollar would soon tumble down that obstacle, and once we experience the benefits which will ultimately follow from the inauguration of this scheme, we will appreciate them too much to let the matter drop. Let us by all means have a training table, at least during the fall and spring terms.

J. H. Hellweg, Jr., '97.

SENIORS VS. FACULTY.

Circuses upon the Polytechnic campus are of such rare occurrence, that the announcement last week that an entertainment upon this order would be furnished the following Saturday afternoon, had the effect of producing a large and expectant crowd at the appointed time and, needless to say, no one was disappointed.

It was a little past two when the sound of fife and drum drew the attention of the crowd toward the gymnasium, and there presently emerged into view a curious looking procession, which later proved to be the major portion of the Senior class in costumes as different from the ordinary base ball uniform as it was possible to make them. The line of march was round the quarter mile track in front of the grand stand, to a point south of it, across to the opposite side of the diamond, where they formed in line, shoulder to shoulder and marched across to the home plate.

To give a detailed description of costumes would be impossible. However, some of the character representations were excellent; most noticeable among which were Trilby, Cupid and Uncle Josh.

The game that followed was one of the richest and most exciting ever played on the campus. The Profs. played for blood, and to the surprise of all, occasionally succeeded in catching balls and batting them also at quite opportune times. The students gave them every encouragement, yelling for them upon every occasion. Nearly every decision of the umpires caused a howl, and their's was no easy task ; for the umpiring of such a game

would have taxed the ability of the most experienced umpire.

The base running was something remarkable, and was of a nature calculated to make the hair of the average good ball player stand on end. Occasionally the players stopped the balls with their hands; now and then their hats or bodies were resorted to as a means of intercepting the sphere in its flight; but most frequently it wasn't intercepted at all. A fly ball caused the assemblage of all the team within running distance in a wild effort to capture it; swiftly batted balls were treated with the utmost respect, and as a usual thing were allowed to pursue their course uninterrupted.

At the end of five innings the contest for supremacy was awarded to the Seniors; the score being 18 to 11 in their favor, but the Profs seemed in no way dejected over the result, and, in fact, were quite proud of the eleven runs they had piled up.

A list of the teams and their playing positions would no doubt prove interesting, but the Senior nine (?) was such a variable quantity that it was impossible to keep track of it.

THE GYMNASIUM OPENED.

The formal opening of the brand new gymnasium building on the evening of May 22 was made the occasion of a very pleasant reception to students and friends of the institute. President Mees called the assembled company to order at 8:30 o'clock and recalled briefly the history of the building in which they were gathered and whose opening was to be celebrated. He paid just tribute to its designers, Mr. McMeans, of '96, and Mr. Foltz, of '86. Concluding his remarks, he introduced Colonel Wm. E. McLean, who spoke with his usual eloquence for a half hour. Mayor Ross was then called on and offered a few words of congratulation to the institute on the successful completion of such a handsome and useful structure. Superintendent Alden, of the Rose Orphan's Home, also spoke of the pleasure and satisfaction which he shared with those more directly interested, in the addition to the equipment of one of Terre Haute's educational institutions. The floor was then cleared and dancing enjoyed until the midnight hour. The Ringgold orchestra furnished the music and refreshments were served in the gallery.

THE SENIOR TRIP.

Early in the present year the Rose Tech Club of Chicago began to urge the many advantages of their own windy city as a field for the explorations of the senior class on its annual excursion. When to the inducements offered by the place alone, were added those of the cordial invitation of the members of the club and their generous offer of assistance in making the arrangements for

the entertainment of the class while there, there was not much surprise to be expressed when the announcement came that Chicago would be the place. This was the second excursion of the kind in the history of the institute, the first one being the trip to St. Louis last year.

The time of departure had been given out as 4:50 a. m. on Monday, May 25. A few minutes before that hour several seniors straggled silently into the Union Depot and dropped down at the lunch counter. When two or three more came in, the hot coffee and sandwiches had served to wake up the first delegation and things began to assume an air more befitting a college affair. When the C. & E. I. train pulled into the sheds and the special car No. 96 was attached to the rear end, the number and enthusiasm of the party had swelled to the yelling point. Dr. Mees came down to see that all got off safely. As the train left the station with all on board, the greater part on the rear platform, the school yell was given with a good will and then a parting salute sent ringing to the President.

At last we were off and the twenty-five seniors and six members of the faculty proceeded at once to take possession of the car. A whole coach reserved for only thirty-two passengers gave plenty of room to spread out and be comfortable. The chemists captured the rear platform as an observation point but were soon routed by a party of electricals who conducted some experiments upon the speed of the train, finding it to be on an average ten miles per cigar consumed. At Danville every one turned out to welcome Ridgely, who joined the party there. Some difficulty was experienced in carrying out the rule that no sleeping should be indulged in under any pretext. Prof. Gray was detected at one time enjoying the forbidden pastime but the opening strains of "R. P. R. P. Rah! Rah!" in the vicinity proved effectual.

The Dearborn Street Station at Chicago was reached at 10 o'clock. A reception committee from the Rose Tech Club was in waiting at the gates. After consigning grips and bicycles to a transfer wagon the party swung into double file and started on a short tour of the business part of the city before lunch. The immense steel arches of the Harrison street station caught the eyes of the civils. The bascule folding bridges over the river were visited and a descent into the lower regions made to see the electrical machinery in operation. At noon the Cafeteria in the Venetian building was reached and the "help yourself" plan of serving given a thorough trial. Watt Klinger found the novelty of having a whole tier of shelves full of strawberry shortcake before him only waiting to be eaten, so tempting that three generous sections disappeared before the novelty wore off.

After lunch the party scattered to meet again at the C. & N. W. station in time for the 1 p. m. train. This landed us after a short ride at Deering station, just north of the Chicago river. Here McCulloch, '94, met the crowd and led the way to the gate of the immense establishment of the Deering Harvesting Machine Co. The company was divided into two sections and the tour of the works begun. Two hours and a half were consumed in the inspection and it was not hard to believe then the statement that a complete binder was finished every three minutes during the working day. Especial attention was attracted by the great Corliss engines of 3,000 horse power in the twine factory. They are the ones that furnished power to the Intramural Railway at the World's Fair. After visiting the works of the Northwestern Terra Cotta Company and the Garden City Wire and Spring Company, a cable train was captured for down town and a tired and hungry crowd found its way to the Leland Hotel. A little rest and a good dinner went far toward overcoming the many resolutions not to go anywhere that evening, and at 8 p. m. a majority of the company walked down to the Central Telephone Exchange and spent an hour very profitably in looking over the building. From the cable tunnel under the street up through dynamo room, cable terminal and battery rooms, to the exchange proper, many things of interest were noted. In the latter room the unusual quiet that reigned was noticeable, some one remarking that it was strange

to think that "here is where the talk of a whole city is focussed."

On Tuesday morning at 8:00 o'clock a suburban train on the Illinois Central was boarded for South Chicago. Arriving there a walk of a few minutes brought the party to the south works of the Illinois Steel Co., where by far the most interesting feature of the whole three days' programme was entered upon. T. S. Condron, '91, acted as pilot and skillfully steered the company through the great buildings filled with glowing furnaces, electric cranes swinging white-hot ingots about in all directions, and numerous ingenious and powerful machines for handling the products of the works. Among the operations witnessed were: rolling steel boiler plates forty feet long by eight feet wide in one heat from the solid ingot in four minutes; rolling sixty foot lengths of T rails at the rate of two a minute; the operation of the nine great blast furnaces; and last but far from least in interest, the working of the Bessemer steel plant with three large converters in full blast. With the long tramp through the bewildering maze of buildings, and the constant dodging of dinkey engines, that went screaming here and there with their loads of red-hot billets or huge ladles of melted iron, every one of the party was ready to seek a place to rest when the round was completed at noon. After lunch at the Leland hotel the chemists, with Dr. Noyes, took the train for Roby, Ind., quieting the exclamations of surprise with which their intended destination was greeted with the reminder that the works of the Standard Oil Co. are located near there. Those of the rest of the company who were not too greatly overcome with the old familiar World's-Fair-tired-feeling, spent the afternoon in visiting the Crane Pipe Works, the works of Fraser & Chalmers, steam engine builders, and those of the Monarch Cycle Co.

At 7 p. m. the members of the visiting party and of the Rose Tech Club of Chicago repaired to the ladies ordinary at the Leland, where an elegant banquet was tendered to the visitors by the club. When the last course had been served and the cigars were going round, President B. R. Putnam, of the Tech Club, arose and in a few happily selected words, extended the greeting and cordial welcome of the members of the club to the class of '96 and the members of the faculty of the institute present. President Decker, of '96, responded for the class. Each of the members of the faculty also responded, expressing great satisfaction at the success of the excursion and the enterprise shown by the Rose Tech Club of Chicago. Brief remarks were then called for from representatives of the different graduating classes present, from THE TECHNIC, and the Athletic Association, represented by its president, W. E. Burk. The '96 quartette, though evidently badly out of practice, interspersed some musical selections here and there. After a somewhat lengthy discussion on the question of an alumni pin, three cheers were proposed and given with a good will for the Rose Tech Club. Then with the senior class yell and that of the institute the company separated, carrying with them the memory of an enjoyable evening.

On Wednesday morning the works of the Western Electric Co. and the Crane Elevator Co. were visited, the most lasting impression of the latter, strange to say, being that of the many stairways to be climbed and descended. The afternoon was by unanimous consent given over to resting up. A project to charter a small tug for a run out on the lake to one of the water works cribs and up to Lincoln Park was spoiled by the hard rain which came up. When a special early dinner had been disposed of at 5:30 p. m. the start was made for the Dearborn Street Station. When the time for starting came Professor Gray's careful count of noses showed all present. As the car slowly moved off, the crowd in the station was treated to a good sample of college enthusiasm, the vaulted roof of the train shed being made to re-echo again and again with the whole category of yells known to class and school. At 11:35 a weary but thoroughly satisfied party left the train at the Union Depot in Terre Haute and a second highly successful senior trip was a matter of Institute history.

NOTES BY THE WAY.

Two hats were distributed along the C. & E. I. right of way, one at Clinton on the way up by Fred Hunt. The other slipped off somewhere into the darkness on the return trip and was mourned by Professor Ames.

The advertising cards in the car were rendered more appropriate by turning them over and printing '96 in varied styles on the back.

Various and oftentimes amusing remarks greeted the rather unusually large party of visitors everywhere. When just leaving the Western Electric Co's works a mail carrier approached one of the boys with the excited question, "What's this? Some of the Western's men out on a strike again?"

Professor H. tried the merits of bicycle shoes as a remedy for worn out feet.

A diversity of means of amusement was displayed on the return trip. Sinks had great sport with a rubber rattle of the sort good to cut teeth on. Pete Klinger, Failey and Burk sat on the rear platform and shouted unmistakably cordial greetings to the country lassies by the wayside until the darkness prevented. Sanborn got overheated under the collar and talked sassy to things and people generally. Professor H. buried himself in a ten cent novel. Professor B. enjoyed a package of cigarettes. The rest of the faculty delegation played pedro.

THE COMMENCEMENT.

The hour of 10 o'clock on the morning of the 18th of the present month found the main hall of the new gymnasium building comfortably filled with friends from the city and from a distance, visiting alumni, and others come to witness the exercises of the twelfth annual commencement. The building had been tastefully decorated with potted plants and festoons of rose and white, and a platform for the speakers erected on the west side. The Ringgold orchestra, from their position in the visitor's gallery overhead, interspersed the numbers of the programme with pleasing selections. Continuing the plan of last year, five members of the graduating class were chosen to read thesis abstracts on this occasion. These were chosen not by any standard of comparative merit, but rather to represent the different classes of work done and to present as far as might be, the subjects of greatest popular interest and hence most easily understood. Much satisfaction has been expressed by those who have attended several of these annual exercises at this change in plan. The following programme was received with the greatest attention:

Music.

Prayer.

Music.

Theses

Comparison of Rheostat and Series Parallel Controllers in Eelectric Street Car Service.
WALTER L. DECKER.

Derivatives of the Neighboring Xylillic Acid.
WILLIAM E. BURK.

Design for a Highway Bridge Across the Wabash River at the Foot of Main Street.
HARRY J. MCDARGH.

Music.

Test of a Compound Locomotive on the Peoria Division of the Vandalia Railroad.
JAMES FARRINGTON.

Test of a Gas Engine, Soldiers and Sailors Monument, Indianapolis, Ind.
ORANGE E. MCMEANS.

Music.

ALUMNI ADDRESS.
MR. JOHN B. AIKMAN.

Presentation of Diplomas.

Awarding of Prizes.

Music.

Benediction.

In the absence of Colonel Richard W. Thompson, the venerable president of the board of managers, the vice-president, Hon. William Mack, addressed the members of the class in a few words of congratulation and kindly advice just previous to the presentation of diplomas. His high tribute to the place occupied by the institute in the ranks of technical schools, and the thorough, painstaking work of the members of the faculty, was received with hearty applause.

The Heminway gold medal, awarded annually to the member of the senior class whose standing is highest for the four years' course, was given to Wallis R. Sanborn, Rockford, Ills.

The bronze medal, a *fac simile* of the gold one, was awarded to James J. McLellan, of Louisville, Ky., for highest standing in the freshman class.

Honorable mention was made as follows:

In the senior class—W. R. Sanborn, Rockford, Ills.

In the junior class—Herman L. Heichert, Marion, Ind.; Benjamin F. Chandler, Guilford, Ver.; J. H. Hall, Danville, Ill.; Robert A. Philip, Sacramento, Cal.

In the sophomore class—Harry B. Stilz, Louisville, Ky.; A. C. Eastwood, Louisville, Ky.

In the freshmen class—J. J. McLellan, Louisville, Ky.; W. H. Insley, Terre Haute.

The alumni address delivered by Mr. John B. Aikman, '87, is printed in full in another place in this issue.

The following are the candidates for degrees with the titles of their theses:

FOR DEGREE OF CIVIL ENGINEER.

The Railway System of Japan.
TARO TSUJI, M. S.

FOR DEGREE OF MASTER OF SCIENCE.

Station Testing Practice.
BUCKNER SPEED, B. S.

FOR DEGREE OF BACHELOR OF SCIENCE.

Test of a Compound Locomotive on the Peoria Division of the Vandalia Railroad.
BRUCE F. FAILEY, RICHARD MERIWETHER, JAMES FARRINGTON.

Test of a Gas Engine, Soldiers and Sailors Monument, Indianapolis, Ind.
ORANGE E. MCMEANS, OSCAR G. RICE.

A Bicycle Dynamometer.
P. W. KLINGER.

A Test of Weldless Steel Tubing.
W. J. KLINGER.

Comparative Test of Series Parallel and Rheostat Controllers in Electric Street Railway Service.
WALTER L. DECKER, F. ELBERT SMITH, FRED G. HUNT, HARRY T. LIGGETT.

Hirn's Analysis Applied to a Brown Engine.
UHEL U. CARR, BARRINGTON O'BRIEN, LINUS SANFORD, JR.

Investigation of Alternate Current Transformers and Motors.
ROBERT W. BEEBE, GEO. E. WELIS,

Experiments on the Flow of Water Through Thin-plate Orifices.
WALLIS R. SANBORN, FRANK F. SINKS.

Design for a Highway Bridge Across the Wabash River at the Foot of Main Street.
HARVEY H. MEADOWS, HARRY J. MCDARGH.

A Proposed Viaduct for the Opening of Ohio Street Over the Evansville & Terre Haute Railroad Tracks.
J. MILTON VANAUKEN.

Resistance of Oxide Films to the Electric Current.
FRANK F. GREEN, CLARENCE M. RIDGLEY.

Method of Determining Sulphur in Coal.
LOUIS I. M. WERK.

Derivatives of the Neighboring Xylillic Acid.
WILLIAM E. BURK.

A Study of the Terre Haute Gas Light Company's Plant.
EDWARD WALSER.

Derivatives of Cis Campholytic Acid.
ELLSWORTH B. HARRIS.

THE COMMENCEMENT DINNER.

A very pleasant and novel feature of Commencement Day was the informal dinner of the members of the graduating class at the Terre Haute. The hour was necessarily early, as some of the class wished to leave on the afternoon trains. At 1:15 P. M. the entire class with one exception, twenty-six in number, sat down at a long table in the Ladies Ordinary and enjoyed one of landlord Baur's toothsome repasts, enlivened by an abundance of chatter of the genuine college boarding-club variety. It was a happy idea for the final class meeting and will remain as a pleasing memory with every member present. At its close many parting greetings were exchanged.

THE RECEPTION.

On the evening of the 17th, the new gymnasium was the scene of a most enjoyable reception, tendered to the Senior class by the members of the Faculty. The building was decorated in pleasing style and brilliantly illuminated with arc and incandescent lights. Refreshments were served in the rooms on the second floor, and the Ringgold orchestra discoursed music from the gallery. No set programme of dances had been announced, but the floor was filled with lovers of the graceful art many times during the evening. It was an occasion long to be remembered by the graduates of the morrow and their visiting friends.

Knapp, ex-'97, was in the city a few days last week.

Sanborn—"I took a day off to-night to get out this report.

Hanley: "Professor, is not the earth's axis a little bit off to one side?"

Howell, '99, made the trip to his home at Mt. Sterling, Ky., on his wheel.

J. Marion Jones, ex-'96, sends his congratulations to his former classmates.

Prof. B.: "Do you think that the thickness is directly proportional to the color?"

Some of the diplomas this year bear the handiwork of Ingham, '99, and Ellsworth '98.

Dr. H. H. Ballard left for his home in Baltimore some days before the commencement. He will not return to Rose next year.

Mr. Smith says that '99 has made more and better patterns than any class that he has ever had. He attributes it to the smallness of the class.

Members of the class of '96 should remember that President Mees wishes to know the address of each one at once so that they can be reached during the summer.

Pierson, '97, who comes from Owen county, where they grow things tall, had his shoes half-soled, and complained that the cobbler raised the heels so high that he could not reach his pockets.

Instructor Peddle, of the Drawing Department, was innocently the cause of much incipient gambling among the Freshmen. In settling bills for drawing paper he gave out a quantity of pennies, and the opportunity to "match" was too fine to be resisted.

The Klingers and Ridgley, of '96, were with a party of wheelmen who made the round trip to Crawfordsville on the 14th, riding a total of 140 miles. The first 125 miles was made in ten hours, including several stops.

The Faculty-Senior ball game was a bonanza for the pocket kodak and all other kinds of camera fiends. The products of Instructor Harris' efforts with his little box were unusually good and have been in great demand.

It is a pity our defunct base ball team could not not have had some members of the faculty team. Grosvenor especially distinguished himself as a hard hitter (ask Burk), while McCormick and Smith each had several safe hits. Smith says he could have done better with a cricket ball.

It is told of Dr. M. that he administered a severe verbal chastisement to a certain Freshman for uproarious and unseemly conduct at Lafayette. The victim listened meekly and then remarked quietly, "I am sorry that I could not afford to go, Doctor, but I stayed in Terre Haute that day."

W. H. Keller, ex-95, writes from Coffeyville, Kansas: "Give my respects to the boys. Am principal of the second ward school here. I don't know whether I will every get back to the Poly or not, but I always take an interest in news from there. I read THE TECHNIC every month, ads. and all."

Athletes in the under classes will be put to the necessity of humping themselves next year to make up for those who go out with '96. Those members of the team who graduate are P. W. Klinger, W. J. Klinger, W. L. Decker, H. T. Liggett, C. M. Ridgely, O. E. McMeans, Jas. Farrington and Richard Meriwether.

Instructor M. asked the other day if there were any problems on the board the boys would like to have explained. Flickenger asked for "Biscuit Hanleys." Mac referred him to a boarding house as the best place to study biscuits.

Prof. Kendrick received a Crooke's tube, ordered some months ago, a few days after the close of the term and has obtained some splendid results. He is at present conducting experiments to determine, if possible, something as to the nature and source of the rays.

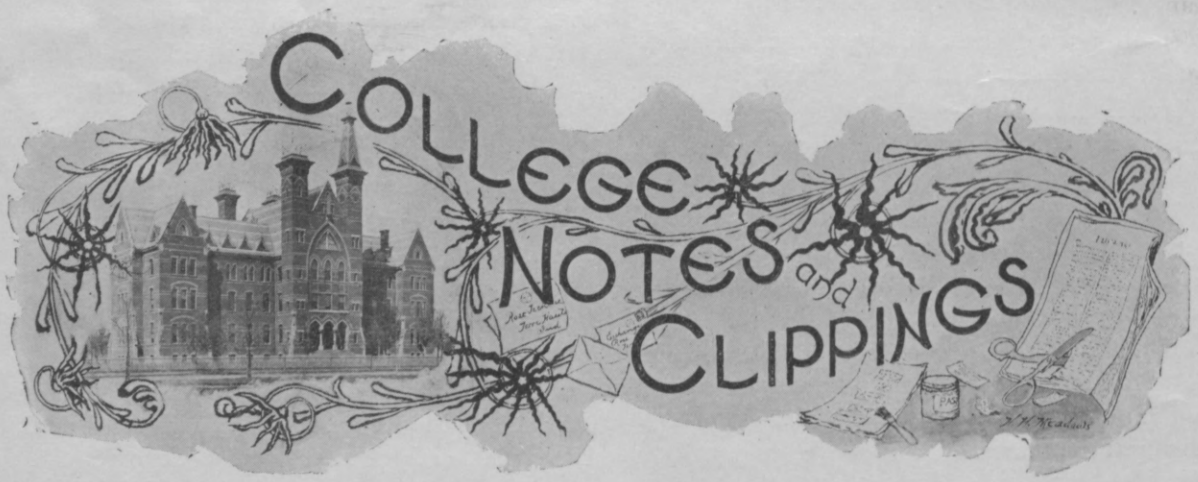
Rose athletes won the lion's share of the prizes at the athletic contests held in connection with the Wabash Cycling club races at the fair grounds on May 30. This was in spite of the fact that they had worked hard at Lafayette the day before and arrived at Terre Haute at the pleasant hour of 4 A. M., that morning.

"Well, Doctor," asked a Senior, anxiously, a few days before commencement, "did we all get through?"

"All I can say," was the answer, "is that I sincerely hope that you did."

"Yes," said the would-be alumnus, "but that isn't strong enough for me to write to my folks to come."

On account of Col. R. W. Thompson's absence in attendance upon the St. Louis convention, his signature could not be secured upon the diplomas of the graduating class previous to the 18th. The class was given their choice of leaving their sheepskins until his return, or receiving them at once with the signature of the secretary of the board substituted. They decided unanimously to wait for the autograph of "the old man eloquent;" a valuable souvenir in itself.



The law of sines.—"Post no bills."

There are over 200 college papers published in America.

A problem of the times.—The physical lecture room clock.

The May number of the *Lombard Review* completes an interesting article on athletics.

Joy! bliss! rapture! June 22, the longest day in the year comes during vacation.—*High School Trumpet.*

There are 226 men at Columbia receiving tuition free or reduced.—*Brown and White.*

The farewells to the Seniors, throughout the country, are prominent in most of the exchanges this month.

At Harvard, the students have mock caucuses and elections. At a recent republican caucus the candidates chosen to be supported in a later convention were McKinley, Reed, Morton and Harrison.

The May number of the Pratt Institute Monthly was quite an art magazine, being their museum number and devoted to art subjects.

Eight thousand women in this country have graduated from reputable colleges and universities, co-educational or otherwise.—*Pennsylvania.*

Three new departments have been established at Harvard; the department of Slavic Languages, the department of Celtic, and the department of Mining and Metallurgy.

The Olympic games in 1900 will be held in Paris, and in 1904 the committee will choose between New York, Berlin and Stockholm.—*Ex.*

She had a lovely neck,
And everybody said—
Who, indeed, might doubt?—
That that's what turned her head.

—*Detroit Tribune.*

The largest universities of the West with the number of students in each are as follows: Michigan, 2,964; Northwestern, 2,413; Wisconsin, 1,520; Minnesota, 1,828; Chicago, 1,265.—*Brown and White.*

'Tis wrong for any maid to be
Abroad at night alone;
A chaperon she needs till she
Can call some chap'er own.

—*Ex.*

Through the generosity of the Havemeyer family, the great sugar dealers, Columbia will have the finest building for the study of chemistry on this side of the Atlantic. It will be located on the new site of Columbia at Woringside Heights, and will cost $500,000. It is a memorial to Frederick Havemeyer, and will be known by that name.—*Integral.*

The following may be of interest to freshmen pursuing the study of chemistry: "Potassium, iodide and sulphur, under slight pressure, give an exceedingly interesting result, as follows:

KI+2S=KISS.

This experiment is dangerous, as the above result may not be accomplished, and instead, the reaction may be very violent. Therefore this experiment should be tried in the absence of light and when few (usually two) are present.—*Illini.*

The largest mastodon in the country is now being mounted by Ward of Rochester, and is to be placed in the museum at Rutgers. The skeleton was unearthed in New Jersey, and measures thirteen feet in height and twenty-one in length, including the tusks.—*Ex.*

A Tech one day through a hole in his coat
Lost a brand-new ten-dollar bill.
North, south, east and west, through the length of the town
He searched and he sought with a will.
Then he took down his text-book and pencil and pad,
And he smiled, did this wisest of Techs;
"For," he said, "the bill's lost, and since I know (wh)y,
It will not take me long to find X.

—*W. P. I.*

College libraries in America are increasing the number of their volumes. The Harvard library contains now over 430,000 volumes; that of the University of Chicago, 250,000; Yale, 180,000; Columbia, 165,000; Cornell, 150,000; University of Pennsylvania, 100,000; Princeton, 91,000; Lehigh, 90,000; Michigan, 80,000; Dartmouth, 75,000; Brown, 73,000; Amherst, 61,000; and Johns Hopkins, 60,000.—*Pennsylvania.*

Taro Tsuji, who left the Institute and afterwards graduated from the Rose Polytechnic Institute in the same year that he would have graduated from Rensselaer, served as engineer in the war between Japan and China. Last December the emperor decorated him with the Order of the Rising Sun as acknowledgment of his services in the said war. He has just sent his thesis for final degree to the Rose Polytechnic Institute. He has already received two degrees from that institution. —*Polytechnic.*

Yale won the pennant in the Eastern Field Sports this year, with Pennsylvania second. Some excellent records were made; Wefers, of Georgetown, covered the 100 yards in $9\frac{4}{5}$ seconds, and broke the world's record in the 220 yards dash, making it in $21\frac{1}{5}$ seconds. Hollister, of Harvard, broke the record in the half mile run in $1{:}59\frac{4}{5}$. Winsor, of Pennsylvania, broke the intercollegiate record in the running high jump by clearing 6 ft. 1 in. The mile run was made in $4{:}28\frac{4}{5}$. In the pole vault 11 ft. 3 in. were cleared.